# OBSERVATIONS & RECOMMENDATIONS

After reviewing data collected from **PINE RIVER POND**, the program coordinators recommend the following actions.

#### FIGURE INTERPRETATION

- Figure 1: These graphs illustrate concentrations of chlorophyll-a in the water column. Algae are microscopic plants that are a natural part of lake ecosystems. Algae contain chlorophyll-a, a pigment necessary for photosynthesis. A measure of chlorophyll-a can indicate the abundance of algae in a lake. The historical data (the bottom graph) show a *stable* in-lake chlorophyll-a trend. Chlorophyll concentrations decreased as the summer progressed. Wet weather in June and July likely caused excess nutrients to be washed into the lake, which can increase algal growth. Algal abundance in Pine River Pond has remained below the NH mean for over ten years! The algae present in the pond are a healthy mix of algae common to New Hampshire's lakes and ponds. While algae are present in all lakes, an excess amount of any type is not welcomed. Concentrations can increase when there are external and internal sources of phosphorus, which is the nutrient algae depend upon for growth. It's important to continue the education process and keep residents aware of the sources of phosphorus and how it influences lake quality.
- ➤ Figure 2: Water clarity is measured by using a Secchi disk. Clarity, or transparency, can be influenced by such things as algae, sediments from erosion, and natural colors of the water. The graphs on this page show historical and current year data. The lower graph shows a *fairly stable* trend in lake transparency. There was an overall decrease in lake transparency this season. The decrease in clarity early in the season was most likely caused by the elevated algae growth. Water clarity improved as the season progressed, and mean transparency values remain above the NH mean reference line. The 2000 sampling season was considered to be wet and, therefore, average transparency readings are expected to be slightly lower than last year's readings. Higher amounts of rainfall usually cause more eroding of sediments into the lake and streams, thus decreasing clarity.
- Figure 3: These figures show the amounts of phosphorus in the epilimnion (the upper layer in the lake) and the hypolimnion (the

lower layer); the inset graphs show current year data. Phosphorus is the limiting nutrient for plants and algae in New Hampshire waters. Too much phosphorus in a lake can lead to increases in plant growth over time. These graphs show a *stable* trend in the upper water layer, and a *slightly improving* trend in the lower water layer. July, August, and September phosphorus concentrations in the hypolimnion were elevated due to the samples being turbid. Sample contamination with bottom sediment can raise phosphorus concentrations and yield inaccurate results. Phosphorus concentrations in the epilimnion remained low this season, and have been below the NH mean reference line for six years. One of the most important approaches to reducing phosphorus levels is educating the public. introduce phosphorus to lakes by several means: fertilizing lawns, septic system failures, and detergents containing phosphates are just a few. Keeping the public aware of ways to reduce the input of phosphorus to lakes means less productivity in the lake. Contact the VLAP coordinator for tips on educating your lake residents or for ideas on testing your watershed for phosphorus inputs.

#### **OTHER COMMENTS**

- Please note in June this summer phosphorus levels were found to be less than 5 μg/L in the epilimnion, metalimnion (middle water layer), and James Young Bk. The NHDES Laboratory Services adopted a new method of analyzing total phosphorus this year and the lowest value that can be recorded is less than 5 μg/L. If this caused an increase in the average phosphorus for either of the layers we would like to remind the association that a reading of 5 μg/L is still considered low for New Hampshire's waters.
- Once again, the turbidities of the hypolimnion samples were higher than desirable in August and September (Table 11). Bottom sediment, which normally has phosphorus bound to it, can raise phosphorus concentrations when found in high amounts in samples. Phosphorus concentrations in the hypolimnion were not extremely high, which is a good sign for the pond. The sediment contamination of the samples does yield inaccurate results and we hope to see phosphorus concentrations in the hypolimnion decrease next season. Sediments are often stirred up when sounding the bottom of the pond with the Kemmerer bottle for depth. If this occurs, please wait for the sediment to settle before taking the sample, or try sampling off of a different side of the boat to obtain a clean sample. Also, the bottom can be sounded with either a depth finder or a fish finder with depth readings.
- ➤ Dissolved oxygen was high throughout the water column (Table 9). As stratified lakes age, oxygen is depleted in the lower layer by the process of decomposition. The lack of this aging indicator is a sign of the lake's overall health.

#### Notes

- ➤ Monitor's Note (7/10/00): Overnight moderate rain.
- $\blacktriangleright$  Monitor's Note (9/11/00): Everything is fine.

#### **USEFUL RESOURCES**

Aquatic Plants and Their Role in Lake Ecology, WD-BB-44, NHDES Fact Sheet, (603) 271-3503 or <a href="https://www.state.nh.us">www.state.nh.us</a>

Best Management Practices to Control Nonpoint Source Pollution: A Guide for Citizens and Town Officials, NHDES-WD 97-8, NHDES Booklet, (603) 271-3503

Erosion Control for Construction in the Protected Shoreland Buffer Zone, WD-BB-30, NHDES Fact Sheet, (603) 271-3503 or www.state.nh.us

Vegetated Phosphorus Buffer Strips, NH Lakes Association pamphlet, (603) 226-0299 or www.nhlakes.org

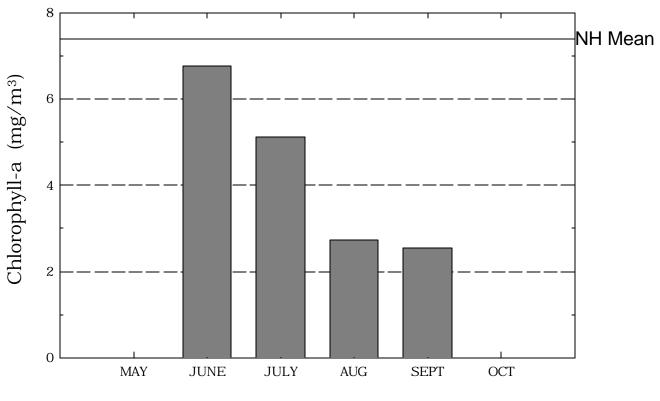
*In Our Backyard*. 1994. Terrence Institute, 4 Herbert St., Alexandria, VA. 22305, or call (800) 726-4853.

Comprehensive Shoreland Protection Act, RSA 483-B, WD-BB-35, NHDES Fact Sheet. (603) 271-3503 or <a href="https://www.state.nh.us">www.state.nh.us</a>

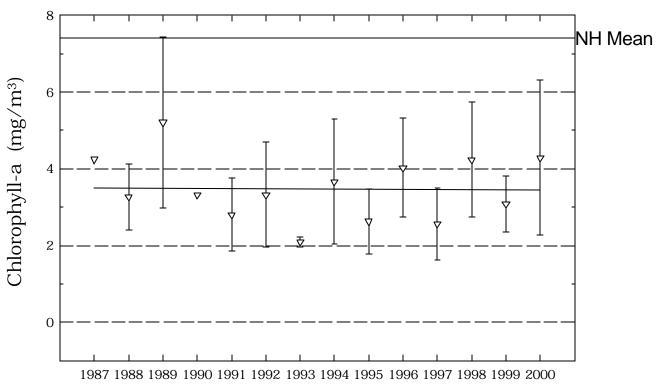
Minimum Shoreland Protection Standards, WD-BB-36, NHDES Fact Sheet. (603) 271-3503 or www.state.nh.us

### Pine River Pond

Figure 1. Monthly and Historical Chlorophyll-a Results

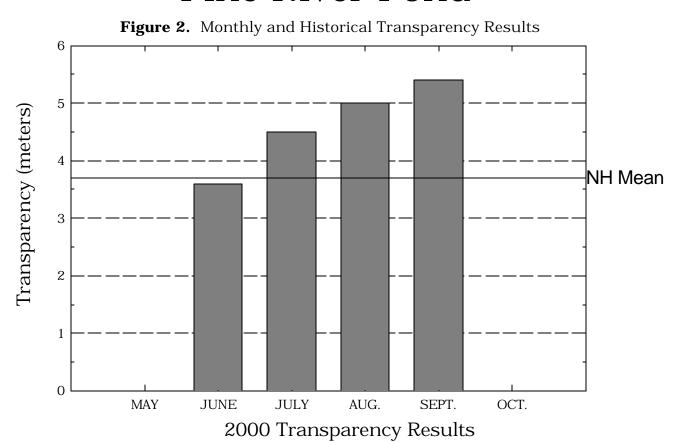


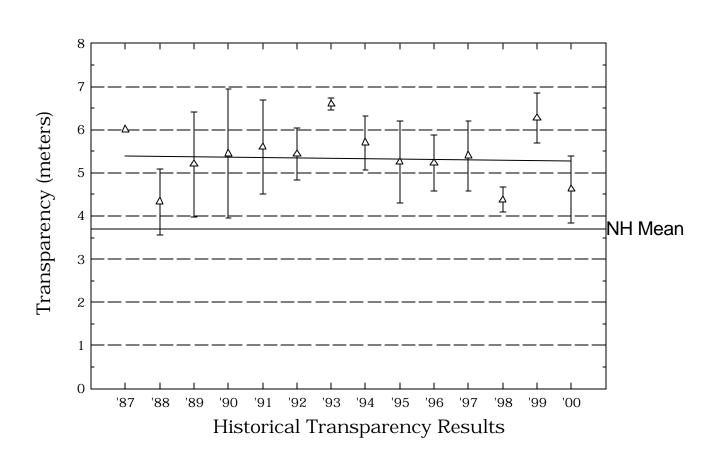
2000 Chlorophyll-a Results



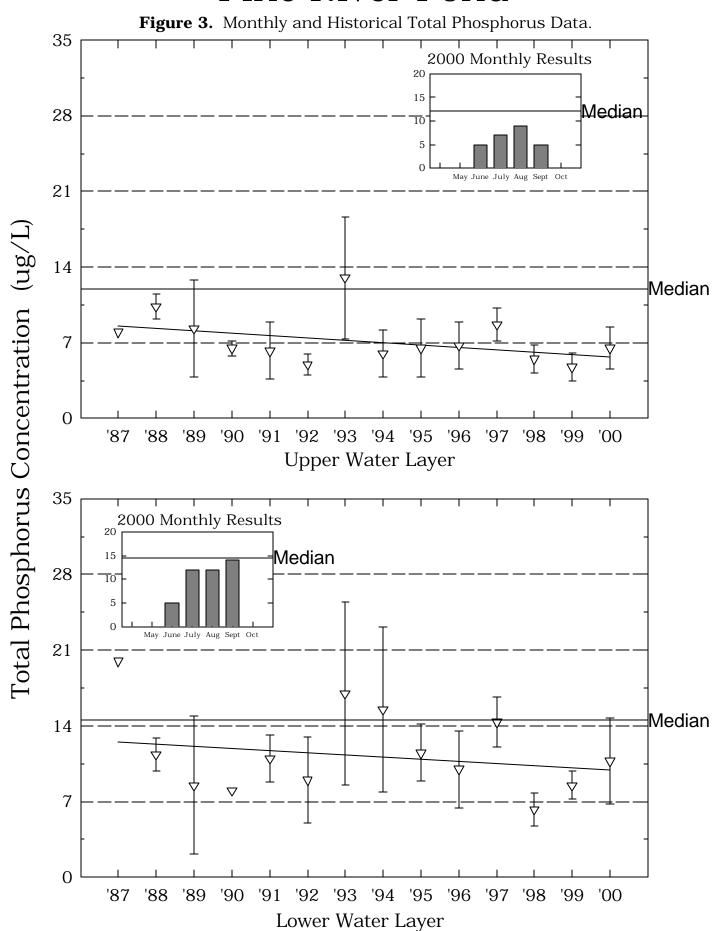
Historical Chlorophyll-a Results

### Pine River Pond





## Pine River Pond



#### Table 1.

## PINE RIVER POND WAKEFIELD

## Chlorophyll-a results (mg/m $\,$ ) for current year and historical sampling periods.

| Year | Minimum | Maximum | Mean |
|------|---------|---------|------|
| 1987 | 4.24    | 4.24    | 4.24 |
| 1988 | 2.66    | 3.87    | 3.26 |
| 1989 | 3.68    | 7.76    | 5.21 |
| 1990 | 3.32    | 3.32    | 3.32 |
| 1991 | 2.16    | 4.20    | 2.80 |
| 1992 | 1.83    | 4.53    | 3.32 |
| 1993 | 1.99    | 3.65    | 2.60 |
| 1994 | 2.35    | 6.03    | 3.66 |
| 1995 | 1.99    | 3.84    | 2.63 |
| 1996 | 2.92    | 5.88    | 4.02 |
| 1997 | 1.64    | 3.84    | 2.55 |
| 1998 | 2.94    | 6.12    | 4.23 |
| 1999 | 2.20    | 3.94    | 3.08 |
| 2000 | 2.54    | 6.76    | 4.28 |

#### Table 2.

## PINE RIVER POND WAKEFIELD

#### Phytoplankton species and relative percent abundance.

#### Summary for current and historical sampling seasons.

| Date of Sample | Species Observed                 | Abundance |
|----------------|----------------------------------|-----------|
| 00 (07 (4007   |                                  | 20        |
| 08/25/1987     | SYNURA                           | 30        |
|                | TABELLARIA                       | 23        |
|                | ASTERIONELLA                     | 13        |
| 03/09/1988     | ASTERIONELLA                     | 49        |
|                | DINOBRYON                        | 42        |
| 06/03/1988     | ASTERIONELLA                     | 68        |
|                |                                  |           |
| 07/28/1989     | DINOBRYON                        | 61        |
|                | ASTERIONELLA                     |           |
|                | CHRYSOSPHAERELLA                 |           |
| 08/22/1990     | CERTIUM                          | 40        |
|                | COELOSPHAERIUM                   | 13        |
|                | ASTERIONELLA                     | 18        |
| 07/11/1991     | CHRYSOSPHAERELLA                 | 36        |
|                | DINOBRYON                        | 34        |
|                | ASTERIONELLA                     | 20        |
| 06/30/1992     | RHIZOSOLENIA                     | 50        |
|                | CHRYSOSPHAERELLA                 | 20        |
|                | DINOBRYON                        | 12        |
| 07/09/1993     | RHIZOSOLENIA                     | 32        |
|                | ASTERIONELLA                     | 29        |
|                | DINOBRYON                        | 14        |
| 06/20/1994     | ASTERIONELLA                     | 41        |
|                | DINOBRYON                        | 35        |
| 00 /10 /1005   |                                  | 00        |
| 06/19/1995     | CHRYSOSPHAERELLA<br>ASTERIONELLA | 68<br>15  |
|                | DINOBRYON                        | 7         |
|                |                                  |           |
| 06/17/1996     | DINOBRYON                        | 83        |
|                | ASTERIONELLA                     | 13        |
|                | SYNURA                           | 3         |

#### Table 2.

## PINE RIVER POND WAKEFIELD

#### Phytoplankton species and relative percent abundance.

#### Summary for current and historical sampling seasons.

| Date of Sample | Species Observed | Relative %<br>Abundance |
|----------------|------------------|-------------------------|
| 06/16/1997     | ASTERIONELLA     | 24                      |
|                | DINOBRYON        | 24                      |
|                | RHIZOSOLENIA     | 18                      |
| 06/15/1998     | DINOBRYON        | 63                      |
|                | TABELLARIA       | 15                      |
|                | ASTERIONELLA     | 8                       |
| 06/14/1999     | ASTERIONELLA     | 47                      |
|                | DINOBRYON        | 33                      |
|                | CHRYSOSPHAERELLA | 9                       |
| 06/12/2000     | ASTERIONLELLA    | 29                      |
|                | SYNURA           | 26                      |
|                | DINOBRYON        | 24                      |

#### Table 3.

## PINE RIVER POND WAKEFIELD

### Summary of current and historical Secchi Disk transparency results (in meters).

| Year | Minimum | Maximum | Mean |
|------|---------|---------|------|
| 1987 | 6.0     | 6.0     | 6.0  |
| 1988 | 3.5     | 5.0     | 4.3  |
| 1989 | 4.1     | 6.5     | 5.2  |
| 1990 | 4.4     | 6.5     | 5.4  |
| 1991 | 4.0     | 6.4     | 5.6  |
| 1992 | 4.8     | 6.0     | 5.4  |
| 1993 | 6.2     | 6.7     | 6.4  |
| 1994 | 5.0     | 6.5     | 5.7  |
| 1995 | 4.0     | 6.0     | 5.2  |
| 1996 | 4.3     | 5.8     | 5.2  |
| 1997 | 4.7     | 6.2     | 5.4  |
| 1998 | 4.0     | 4.6     | 4.3  |
| 1999 | 5.6     | 6.9     | 6.2  |
| 2000 | 3.6     | 5.4     | 4.6  |
|      |         |         |      |

## Table 4. PINE RIVER POND WAKEFIELD

| Station             | Year | Minimum | Maximum | Mean |
|---------------------|------|---------|---------|------|
| BLANIE'S BACK POND  |      |         |         |      |
|                     | 1000 | C 74    | 6 74    | 0.74 |
|                     | 1999 | 6.74    | 6.74    | 6.74 |
| CUTTERS ISLAND COVE |      |         |         |      |
|                     | 1994 | 6.83    | 6.83    | 6.83 |
| EPILIMNION          |      |         |         |      |
|                     | 1987 | 6.80    | 6.80    | 6.80 |
|                     | 1988 | 6.40    | 6.93    | 6.71 |
|                     | 1989 | 7.00    | 7.03    | 7.02 |
|                     | 1990 | 6.89    | 6.95    | 6.92 |
|                     | 1991 | 6.50    | 7.00    | 6.77 |
|                     | 1992 | 6.80    | 6.95    | 6.89 |
|                     | 1993 | 6.88    | 7.00    | 6.95 |
|                     | 1994 | 6.81    | 6.96    | 6.88 |
|                     | 1995 | 6.81    | 6.94    | 6.87 |
|                     | 1996 | 6.38    | 6.89    | 6.65 |
|                     | 1997 | 6.89    | 7.16    | 7.02 |
|                     | 1998 | 5.97    | 6.90    | 6.42 |
|                     | 1999 | 6.45    | 6.87    | 6.62 |
|                     | 2000 | 6.68    | 6.93    | 6.79 |
| HYPOLIMNION         |      |         |         |      |
|                     | 1987 | 6.20    | 6.20    | 6.20 |
|                     | 1988 | 6.20    | 6.86    | 6.39 |
|                     | 1989 | 6.17    | 6.26    | 6.21 |
|                     | 1990 | 6.01    | 6.06    | 6.03 |

Table 4.

PINE RIVER POND

WAKEFIELD

| Station         | Year | Minimum | Maximum | Mean |
|-----------------|------|---------|---------|------|
|                 | 1991 | 6.10    | 6.39    | 6.19 |
|                 | 1992 | 6.14    | 6.31    | 6.21 |
|                 | 1993 | 5.84    | 6.33    | 6.07 |
|                 | 1994 | 5.99    | 6.29    | 6.14 |
|                 | 1995 | 6.23    | 6.49    | 6.36 |
|                 | 1996 | 6.09    | 6.43    | 6.18 |
|                 | 1997 | 5.79    | 6.34    | 6.08 |
|                 | 1998 | 5.79    | 6.24    | 5.96 |
|                 | 1999 | 6.17    | 6.29    | 6.22 |
|                 | 2000 | 6.13    | 6.30    | 6.20 |
| JAMES YOUNG BK  |      |         |         |      |
|                 | 1989 | 6.28    | 6.28    | 6.28 |
|                 | 1990 | 6.07    | 6.07    | 6.07 |
|                 | 1992 | 6.63    | 6.85    | 6.74 |
|                 | 1993 | 6.63    | 6.82    | 6.73 |
|                 | 1994 | 6.62    | 6.85    | 6.71 |
|                 | 1995 | 6.70    | 6.84    | 6.78 |
|                 | 1996 | 6.27    | 6.71    | 6.44 |
|                 | 1997 | 6.53    | 6.97    | 6.72 |
|                 | 1998 | 5.96    | 6.60    | 6.27 |
|                 | 1999 | 6.38    | 6.69    | 6.51 |
|                 | 2000 | 6.56    | 6.70    | 6.65 |
| JENNES/YOUNG BK |      |         |         |      |
|                 | 1990 | 6.61    | 6.61    | 6.61 |
|                 | 1991 | 6.40    | 6.80    | 6.65 |

## Table 4. PINE RIVER POND WAKEFIELD

| Station     | Year | Minimum | Maximum | Mean |
|-------------|------|---------|---------|------|
| MEADOW BK   |      |         |         |      |
|             |      |         |         |      |
|             | 1988 | 6.56    | 6.78    | 6.69 |
|             | 1989 | 6.67    | 6.97    | 6.79 |
|             | 1990 | 6.63    | 6.80    | 6.71 |
|             | 1991 | 6.50    | 6.87    | 6.71 |
|             | 1992 | 6.52    | 6.90    | 6.67 |
|             | 1993 | 6.75    | 6.92    | 6.83 |
|             | 1994 | 6.78    | 6.93    | 6.85 |
|             | 1995 | 6.57    | 6.98    | 6.73 |
|             | 1996 | 5.83    | 6.72    | 6.27 |
|             | 1997 | 6.58    | 6.92    | 6.75 |
|             | 1998 | 5.55    | 6.70    | 5.96 |
|             | 1999 | 6.47    | 6.73    | 6.64 |
|             | 2000 | 6.64    | 6.81    | 6.71 |
| METALIMNION |      |         |         |      |
|             |      |         |         |      |
|             | 1987 | 7.00    | 7.00    | 7.00 |
|             | 1988 | 6.61    | 6.83    | 6.74 |
|             | 1989 | 6.18    | 6.37    | 6.26 |
|             | 1990 | 6.15    | 6.35    | 6.24 |
|             | 1991 | 6.20    | 6.90    | 6.49 |
|             | 1992 | 6.40    | 6.88    | 6.52 |
|             | 1993 | 6.44    | 6.83    | 6.65 |
|             | 1994 | 4.48    | 6.75    | 5.07 |
|             | 1995 | 6.44    | 6.80    | 6.66 |
|             | 1996 | 5.96    | 6.54    | 6.20 |
|             | 1997 | 6.10    | 6.88    | 6.48 |
|             |      |         |         |      |

## Table 4. PINE RIVER POND WAKEFIELD

| Station          | Year | Minimum | Maximum | Mean |
|------------------|------|---------|---------|------|
| METALIMNION      |      |         |         |      |
|                  | 1998 | 5.76    | 6.71    | 6.07 |
|                  | 1999 | 6.44    | 6.67    | 6.56 |
|                  | 2000 | 6.23    | 6.49    | 6.39 |
| OUTLET           |      |         |         |      |
|                  | 1988 | 6.32    | 6.89    | 6.58 |
|                  | 1989 | 6.76    | 7.12    | 6.95 |
|                  | 1990 | 6.93    | 6.93    | 6.93 |
|                  | 1995 | 6.77    | 6.77    | 6.77 |
| QUIMBY BK        |      |         |         |      |
|                  | 1988 | 6.49    | 6.83    | 6.63 |
|                  | 1989 | 6.84    | 6.84    | 6.84 |
| SOUTHEAST CORNER |      |         |         |      |
|                  | 1996 | 6.79    | 6.79    | 6.79 |
| WHITE POND INLET |      |         |         |      |
|                  | 1990 | 5.74    | 5.74    | 5.74 |
|                  | 1991 | 5.80    | 6.00    | 5.89 |
| YOUNG'S COVE     |      |         |         |      |
|                  | 1996 | 6.65    | 6.75    | 6.68 |
|                  | 1998 | 6.23    | 6.23    | 6.23 |
|                  | 1999 | 6.62    | 6.72    | 6.67 |

#### Table 5.

## PINE RIVER POND WAKEFIELD

## Summary of current and historical Acid Neutralizing Capacity. Values expressed in mg/L as CaCO .

#### **Epilimnetic Values**

| Year | Minimum | Maximum | Mean |
|------|---------|---------|------|
| 1987 | 5.40    | 5.40    | 5.40 |
| 1988 | 5.40    | 6.40    | 5.90 |
| 1989 | 5.50    | 7.40    | 6.30 |
| 1990 | 5.20    | 5.40    | 5.30 |
| 1991 | 5.30    | 6.40    | 5.85 |
| 1992 | 5.80    | 6.80    | 6.20 |
| 1993 | 4.90    | 5.60    | 5.27 |
| 1994 | 4.70    | 5.90    | 5.40 |
| 1995 | 4.30    | 6.20    | 5.40 |
| 1996 | 4.90    | 5.50    | 5.23 |
| 1997 | 4.70    | 6.50    | 5.95 |
| 1998 | 3.90    | 8.00    | 5.65 |
| 1999 | 3.40    | 6.80    | 5.86 |
| 2000 | 5.80    | 7.20    | 6.43 |

#### Table 6.

## PINE RIVER POND WAKEFIELD

| Station             | Year | Minimum | Maximum | Mean |
|---------------------|------|---------|---------|------|
| BLANIE'S BACK POND  |      |         |         |      |
|                     | 1999 | 41.6    | 41.6    | 41.6 |
| CUTTERS ISLAND COVE |      |         |         |      |
|                     | 1994 | 46.8    | 46.8    | 46.8 |
| EPILIMNION          |      |         |         |      |
|                     | 1987 | 47.6    | 47.6    | 47.6 |
|                     | 1988 | 42.2    | 47.8    | 45.3 |
|                     | 1989 | 43.9    | 47.6    | 46.0 |
|                     | 1990 | 46.4    | 47.0    | 46.7 |
|                     | 1991 | 44.3    | 45.7    | 45.0 |
|                     | 1992 | 44.7    | 44.8    | 44.7 |
|                     | 1993 | 42.4    | 47.6    | 44.8 |
|                     | 1994 | 42.2    | 47.5    | 45.2 |
|                     | 1995 | 44.9    | 48.5    | 46.5 |
|                     | 1996 | 42.8    | 45.3    | 44.2 |
|                     | 1997 | 40.1    | 42.2    | 41.1 |
|                     | 1998 | 36.1    | 39.7    | 38.0 |
|                     | 1999 | 43.8    | 45.6    | 44.6 |
|                     | 2000 | 43.2    | 45.7    | 44.8 |
| HYPOLIMNION         |      |         |         |      |
|                     | 1987 | 41.5    | 41.5    | 41.5 |
|                     | 1988 | 42.7    | 51.1    | 45.5 |
|                     | 1989 | 46.7    | 48.5    | 47.6 |
|                     | 1990 | 44.4    | 46.2    | 45.3 |
|                     | 1991 | 43.8    | 44.9    | 44.3 |

Table 6.

## PINE RIVER POND WAKEFIELD

| Station         | Year | Minimum | Maximum | Mean  |
|-----------------|------|---------|---------|-------|
|                 | 1992 | 42.0    | 49.3    | 45.6  |
|                 | 1993 | 38.1    | 46.5    | 42.7  |
|                 | 1994 | 38.2    | 50.6    | 44.9  |
|                 | 1995 | 44.5    | 48.0    | 46.0  |
|                 | 1996 | 43.6    | 48.7    | 45.3  |
|                 | 1997 | 38.4    | 41.7    | 40.1  |
|                 | 1998 | 39.2    | 40.8    | 39.6  |
|                 | 1999 | 42.3    | 44.5    | 43.7  |
|                 | 2000 | 43.5    | 54.5    | 47.8  |
| JAMES YOUNG BK  |      |         |         |       |
|                 | 1989 | 88.0    | 88.0    | 88.0  |
|                 | 1990 | 120.0   | 120.0   | 120.0 |
|                 | 1992 | 44.9    | 83.0    | 69.3  |
|                 | 1993 | 57.2    | 112.3   | 90.3  |
|                 | 1994 | 59.0    | 112.5   | 94.3  |
|                 | 1995 | 56.4    | 123.5   | 84.5  |
|                 | 1996 | 28.5    | 93.8    | 61.1  |
|                 | 1997 | 70.4    | 96.0    | 82.8  |
|                 | 1998 | 22.0    | 72.6    | 48.1  |
|                 | 1999 | 71.3    | 83.3    | 77.3  |
|                 | 2000 | 55.1    | 87.7    | 71.8  |
| JENNES/YOUNG BK |      |         |         |       |
|                 | 1990 | 92.9    | 92.9    | 92.9  |
|                 | 1991 | 81.5    | 111.4   | 96.3  |

#### Table 6.

## PINE RIVER POND WAKEFIELD

| Station     | Year | Minimum | Maximum | Mean |
|-------------|------|---------|---------|------|
| MEADOW BK   |      |         |         |      |
|             | 1988 | 32.9    | 67.0    | 49.1 |
|             | 1989 | 34.2    | 42.8    | 38.5 |
|             | 1990 | 43.7    | 45.3    | 44.5 |
|             | 1991 | 41.4    | 52.0    | 47.0 |
|             | 1992 | 44.0    | 49.3    | 47.2 |
|             | 1993 | 41.3    | 54.2    | 47.5 |
|             | 1994 | 42.2    | 51.5    | 46.7 |
|             | 1995 | 46.6    | 56.1    | 50.5 |
|             | 1996 | 31.3    | 53.5    | 46.7 |
|             | 1997 | 54.6    | 58.6    | 56.4 |
|             | 1998 | 24.7    | 57.0    | 46.0 |
|             | 1999 | 61.4    | 73.2    | 66.6 |
|             | 2000 | 60.0    | 85.6    | 68.4 |
| METALIMNION |      |         |         |      |
|             | 1987 | 46.6    | 46.6    | 46.6 |
|             | 1988 | 42.5    | 46.5    | 44.5 |
|             | 1989 | 43.0    | 45.8    | 44.6 |
|             | 1990 | 44.0    | 47.2    | 45.6 |
|             | 1991 | 43.0    | 45.6    | 44.7 |
|             | 1992 | 43.8    | 45.5    | 44.5 |
|             | 1993 | 39.6    | 47.0    | 43.3 |
|             | 1994 | 38.5    | 47.0    | 44.4 |
|             | 1995 | 43.9    | 47.9    | 45.3 |
|             | 1996 | 42.3    | 46.2    | 44.3 |

#### Table 6.

## PINE RIVER POND WAKEFIELD

| 1997   38.5   42.1   40.1     1998   34.1   39.4   36.8     1999   43.3   46.1   45.0     2000   43.3   45.4   44.4     OUTLET  | Station          | Year | Minimum | Maximum | Mean  |
|---|------------------|------|---------|---------|-------|
| 1999 43.3 46.1 45.0 2000 43.3 45.4 44.4 2000 43.3 45.4 44.4 2000 43.3 45.4 44.4 2000 45.9 45.9 45.9 45.9 45.9 45.9 45.9 45.9  |                  | 1997 | 38.5    | 42.1    | 40.1  |
| DUTLET  1988 41.3 44.3 43.1 1989 43.0 47.2 45.2 1990 45.9 45.9 45.9 45.8 1995 46.8 46.8 46.8  QUIMBY BK  1988 99.7 182.7 141.2 1989 87.1 87.1 87.1  SOUTHEAST CORNER 1996 44.8 44.8 44.8 44.8  WENTWORTH COVE 1996 42.9 42.9 42.9  WHITE POND INLET 1990 23.0 23.0 23.0 23.0 1991 20.4 29.9  YOUNG'S COVE   |                  | 1998 | 34.1    | 39.4    | 36.8  |
| OUTLET  1988 41.3 44.3 45.2 1989 43.0 47.2 45.2 1990 45.9 46.8 46.8 46.8  QUIMBY BK  1988 99.7 182.7 141.2 1989 87.1 87.1 87.1  SOUTHEAST CORNER 1996 44.8 44.8 44.8 44.8  WENTWORTH COVE 1996 42.9 42.9 42.9 42.9  WHITE POND INLET 1990 23.0 23.0 23.0 1991 20.4 21.9 21.4  YOUNG'S COVE  |                  | 1999 | 43.3    | 46.1    | 45.0  |
| 1988 41.3 44.3 43.1 1989 43.0 47.2 45.2 1990 45.9 45.9 45.9 1995 46.8 46.8 46.8 46.8 46.8 46.8 46.8 46.8  |                  | 2000 | 43.3    | 45.4    | 44.4  |
| 1989   43.0   47.2   45.9   45.9   45.9   45.9   45.9   46.8 | OUTLET           |      |         |         |       |
| 1990 45.9 46.8 46.8 46.8 46.8 QUIMBY BK  1988 99.7 182.7 141.2 1989 87.1 87.1 87.1 87.1 SOUTHEAST CORNER  1996 44.8 44.8 44.8 44.8 44.8 WENTWORTH COVE  1996 42.9 42.9 42.9 42.9 42.9 42.9 12.0 12.0 12.0 12.0 12.0 12.0 12.0 12.0  |                  | 1988 | 41.3    | 44.3    | 43.1  |
| QUIMBY BK  1988 99.7 182.7 141.2 1989 87.1 87.1 87.1  SOUTHEAST CORNER 1996 44.8 44.8 44.8 44.8  WENTWORTH COVE 1996 42.9 42.9 42.9 42.9  WHITE POND INLET 1990 23.0 23.0 23.0 23.0 1991 20.4 21.9 21.4  YOUNG'S COVE   |                  | 1989 | 43.0    | 47.2    | 45.2  |
| QUIMBY BK  1988 99.7 182.7 141.2 1989 87.1 87.1 87.1  SOUTHEAST CORNER  1996 44.8 44.8 44.8 44.8  WENTWORTH COVE  1996 42.9 42.9 42.9 42.9  WHITE POND INLET  1990 23.0 23.0 23.0 23.0  1991 20.4 21.9 21.4  YOUNG'S COVE  1996 58.7 109.8 85.7   |                  | 1990 | 45.9    | 45.9    | 45.9  |
| 1988 99.7 182.7 141.2 1989 87.1 87.1 87.1  SOUTHEAST CORNER 1996 44.8 44.8 44.8 44.8  WENTWORTH COVE 1996 42.9 42.9 42.9 42.9  WHITE POND INLET 1990 23.0 23.0 23.0 23.0 1991 20.4 21.9 21.4  YOUNG'S COVE 1996 58.7 109.8 85.7   |                  | 1995 | 46.8    | 46.8    | 46.8  |
| 1989   87.1   87.1   87.1   | QUIMBY BK        |      |         |         |       |
| SOUTHEAST CORNER  1996 44.8 44.8 44.8  WENTWORTH COVE  1996 42.9 42.9 42.9 42.9  WHITE POND INLET  1990 23.0 23.0 23.0 23.0  1991 20.4 21.9 21.4  YOUNG'S COVE  1996 58.7 109.8 85.7  |                  | 1988 | 99.7    | 182.7   | 141.2 |
| 1996       44.8       44.8       44.8         WENTWORTH COVE       1996       42.9       42.9       42.9       42.9         WHITE POND INLET       1990       23.0       23.0       23.0       23.0       23.0       23.0       21.4         YOUNG'S COVE       1996       58.7       109.8       85.7  |                  | 1989 | 87.1    | 87.1    | 87.1  |
| WENTWORTH COVE  1996 42.9 42.9 42.9  WHITE POND INLET  1990 23.0 23.0 23.0 23.0  1991 20.4 21.9 21.4  YOUNG'S COVE  1996 58.7 109.8 85.7  | SOUTHEAST CORNER |      |         |         |       |
| HITTE POND INLET  1996 42.9 42.9 WHITTE POND INLET  1990 23.0 23.0 23.0 23.0 23.0 21.4 YOUNG'S COVE  1996 58.7 109.8 85.7   |                  | 1996 | 44.8    | 44.8    | 44.8  |
| WHITE POND INLET  1990 23.0 23.0 23.0 23.0  1991 20.4 21.9 21.4  YOUNG'S COVE  1996 58.7 109.8 85.7   | WENTWORTH COVE   |      |         |         |       |
| 1990 23.0 23.0 23.0 23.0 1991 20.4 21.9 21.4 YOUNG'S COVE 1996 58.7 109.8 85.7  |                  | 1996 | 42.9    | 42.9    | 42.9  |
| 1991 20.4 21.9 21.4 YOUNG'S COVE 1996 58.7 109.8 85.7   | WHITE POND INLET |      |         |         |       |
| YOUNG'S COVE<br>1996 58.7 109.8 85.7  |                  | 1990 | 23.0    | 23.0    | 23.0  |
| 1996 58.7 109.8 85.7  |                  | 1991 | 20.4    | 21.9    | 21.4  |
|   | YOUNG'S COVE     |      |         |         |       |
| 1998 61.7 61.7 61.7   |                  | 1996 | 58.7    | 109.8   | 85.7  |
|   |                  | 1998 | 61.7    | 61.7    | 61.7  |
| 1999 79.2 92.2 85.7   |                  | 1999 | 79.2    | 92.2    | 85.7  |

#### Table 8.

## PINE RIVER POND WAKEFIELD

| Station             | Year         | Minimum | Maximum | Mean    |
|---------------------|--------------|---------|---------|---------|
| 3 FT BOAT ACCESS    |              |         |         |         |
|                     | 1998         | 7       | 7       | 7       |
| 8 FT BOAT ACCESS    |              |         |         |         |
|                     | 1998         | 10      | 10      | 10      |
| BLANIE'S BACK POND  | 4000         |         |         | 0       |
|                     | 1999         | 8       | 8       | 8       |
| CUTTERS ISLAND COVE | 1994         | 5       | 5       | 5       |
| EPILIMNION          |              |         |         |         |
|                     | 1987         | 8       | 8       | 8       |
|                     | 1988         | 3       | 11      | 8       |
|                     | 1989         | 4       | 13      | 8       |
|                     | 1990         | 6       | 7       | 6       |
|                     | 1991         | 4       | 10      | 6       |
|                     | 1992<br>1993 | 4<br>8  | 6<br>17 | 5<br>11 |
|                     | 1994         | 4       | 9       | 6       |
|                     | 1995         | 4       | 10      | 6       |
|                     | 1996         | 5       | 10      | 6       |
|                     | 1997         | 7       | 10      | 8       |
|                     | 1998         | 4       | 7       | 5       |
|                     | 1999         | 3       | 6       | 4       |
|                     | 2000         | < 5     | 9       | 6       |

## Table 8. PINE RIVER POND WAKEFIELD

| Station        | Year | Minimum | Maximum | Mean |
|----------------|------|---------|---------|------|
| HYPOLIMNION    |      |         |         |      |
|                | 1987 | 20      | 20      | 20   |
|                | 1988 | 6       | 13      | 10   |
|                | 1989 | 4       | 13      | 8    |
|                | 1990 | 8       | 8       | 8    |
|                | 1991 | 9       | 14      | 11   |
|                | 1992 | 5       | 13      | 9    |
|                | 1993 | 9       | 23      | 14   |
|                | 1994 | 9       | 26      | 15   |
|                | 1995 | 8       | 14      | 11   |
|                | 1996 | 6       | 13      | 10   |
|                | 1997 | 13      | 17      | 14   |
|                | 1998 | 5       | 8       | 6    |
|                | 1999 | 7       | 10      | 8    |
|                | 2000 | 5       | 14      | 10   |
| JAMES YOUNG BK |      |         |         |      |
|                | 1989 | 7       | 7       | 7    |
|                | 1990 | 7       | 7       | 7    |
|                | 1992 | 12      | 16      | 14   |
|                | 1993 | 12      | 26      | 20   |
|                | 1994 | 7       | 21      | 16   |
|                | 1995 | 5       | 18      | 13   |
|                | 1996 | 20      | 27      | 23   |
|                | 1997 | 10      | 18      | 14   |
|                | 1998 | 12      | 17      | 14   |

## Table 8. PINE RIVER POND

WAKEFIELD

| Station         | Year | Minimum | Maximum | Mean |
|-----------------|------|---------|---------|------|
|                 | 1999 | 14      | 16      | 15   |
|                 | 2000 | < 5     | 18      | 11   |
| JENNES/YOUNG BK |      |         |         |      |
|                 | 1990 | 19      | 19      | 19   |
|                 | 1991 | 15      | 25      | 18   |
| MEADOW BK       |      |         |         |      |
|                 | 1988 | 15      | 24      | 18   |
|                 | 1989 | 8       | 18      | 13   |
|                 | 1990 | 11      | 17      | 14   |
|                 | 1991 | 12      | 18      | 15   |
|                 | 1992 | 12      | 13      | 12   |
|                 | 1993 | 11      | 39      | 24   |
|                 | 1994 | 19      | 23      | 21   |
|                 | 1995 | 13      | 47      | 24   |
|                 | 1996 | 11      | 15      | 12   |
|                 | 1997 | 14      | 19      | 16   |
|                 | 1998 | 11      | 15      | 12   |
|                 | 1999 | 9       | 16      | 13   |
|                 | 2000 | 6       | 22      | 14   |
| METALIMNION     |      |         |         |      |
|                 | 1988 | 8       | 9       | 8    |
|                 | 1989 | 6       | 12      | 9    |
|                 | 1990 | 8       | 13      | 10   |
|                 | 1991 | 5       | 10      | 8    |
|                 | 1992 | 5       | 8       | 6    |

## Table 8. PINE RIVER POND WAKEFIELD

| Station          | Year | Minimum | Maximum | Mean |
|------------------|------|---------|---------|------|
|                  | 1993 | 7       | 24      | 13   |
|                  | 1994 | 7       | 16      | 9    |
|                  | 1995 | 5       | 14      | 8    |
|                  | 1996 | 6       | 11      | 7    |
|                  | 1997 | 7       | 15      | 10   |
|                  | 1998 | 3       | 11      | 8    |
|                  | 1999 | 4       | 7       | 5    |
|                  | 2000 | < 5     | 11      | 8    |
| OUTLET           |      |         |         |      |
|                  | 1988 | 7       | 9       | 7    |
|                  | 1989 | 5       | 13      | 8    |
|                  | 1990 | 8       | 8       | 8    |
|                  | 1995 | 7       | 7       | 7    |
| QUIMBY BK        |      |         |         |      |
|                  | 1988 | 1       | 5       | 3    |
|                  | 1989 | 4       | 4       | 4    |
| SOUTHEAST CORNER |      |         |         |      |
|                  | 1996 | 9       | 9       | 9    |
| WENTWORTH COVE   |      |         |         |      |
|                  | 1996 | 9       | 9       | 9    |
| WHITE POND INLET |      |         |         |      |
|                  | 1990 | 16      | 16      | 16   |
|                  | 1991 | 6       | 9       | 7    |

#### Table 8.

## PINE RIVER POND WAKEFIELD

| Station      | Year | Minimum | Maximum | Mean |
|--------------|------|---------|---------|------|
| YOUNG'S COVE |      |         |         |      |
|              | 1993 | 5       | 5       | 5    |
|              | 1996 | 7       | 14      | 10   |
|              | 1998 | 18      | 18      | 18   |
|              | 1999 | 8       | 13      | 10   |

## Table 9. PINE RIVER POND WAKEFIELD

#### Current year dissolved oxygen and temperature data.

| Depth (meters) | Temperature (celsius) | Dissolved Oxygen (mg/L) | Saturation (%) |
|----------------|-----------------------|-------------------------|----------------|
|                |                       | June 12, 2000           |                |
| 0.1            | 17.6                  | 8.7                     | 91.5           |
| 1.0            | 17.6                  | 8.7                     | 91.6           |
| 2.0            | 17.6                  | 8.7                     | 91.4           |
| 3.0            | 17.5                  | 8.7                     | 90.9           |
| 4.0            | 17.4                  | 8.7                     | 91.2           |
| 5.0            | 15.6                  | 8.7                     | 90.4           |
| 6.0            | 14.0                  | 8.1                     | 81.8           |
| 7.0            | 11.1                  | 7.7                     | 74.9           |
| 8.0            | 9.6                   | 8.2                     | 74.3           |
| 9.0            | 8.8                   | 8.1                     | 71.3           |
| 10.0           | 8.4                   | 7.3                     | 63.1           |
| 11.0           | 8.2                   | 6.9                     | 59.2           |
| 12.0           | 8.1                   | 5.9                     | 50.3           |
| 13.0           | 8.1                   | 5.6                     | 47.2           |
| 14.0           | 8.0                   | 4.7                     | 40.0           |
| 15.0           | 8.0                   | 4.0                     | 33.9           |
| 16.0           | 8.0                   | 3.3                     | 27.9           |

## Table 10. PINE RIVER POND WAKEFIELD

#### Historic Hypolimnetic dissolved oxygen and temperature data.

| Date            | Depth    | Temperature | Dissolved Oxygen | Saturation |
|-----------------|----------|-------------|------------------|------------|
|                 | (meters) | (celsius)   | (mg/L)           | (%)        |
| August 25, 1987 | 14.5     | 7.6         | 0.4              | 3.0        |
| March 9, 1988   | 13.0     | 4.0         | 5.6              | 42.0       |
| June 3, 1988    | 15.0     | 7.6         | 6.4              | 54.0       |
| July 28, 1989   | 17.0     | 8.0         | 1.7              | 14.0       |
| August 22, 1990 | 14.0     | 7.3         | -0.5             | -4.1       |
| July 11, 1991   | 13.0     | 8.2         | 4.6              | 38.9       |
| June 30, 1992   | 14.0     | 6.0         | 5.3              | 42.4       |
| July 9, 1993    | 13.7     | 6.8         | 3.4              | 27.0       |
| June 20, 1994   | 12.8     | 8.9         | 4.2              | 36.0       |
| June 19, 1995   | 15.0     | 9.1         | 1.7              | 14.0       |
| June 17, 1996   | 13.5     | 9.0         | 3.4              | 29.0       |
| June 16, 1997   | 13.5     | 11.5        | 0.6              | 6.0        |
| June 15, 1998   | 14.0     | 7.4         | 4.7              | 38.0       |
| June 14, 1999   | 12.0     | 8.3         | 4.8              | 40.8       |
| June 12, 2000   | 16.0     | 8.0         | 3.3              | 27.9       |

## Table 11. PINE RIVER POND WAKEFIELD

## Summary of current year and historic turbidity sampling. Results in NTU's.

| Station            | Year | Minimum | Maximum | Mean |
|--------------------|------|---------|---------|------|
| BLANIE'S BACK POND |      |         |         |      |
|                    | 1999 | 0.5     | 0.5     | 0.5  |
| EPILIMNION         |      |         |         |      |
|                    | 1997 | 0.2     | 0.4     | 0.3  |
|                    | 1998 | 0.0     | 0.5     | 0.3  |
|                    | 1999 | 0.3     | 0.5     | 0.4  |
|                    | 2000 | 0.2     | 0.5     | 0.3  |
| HYPOLIMNION        |      |         |         |      |
|                    | 1997 | 0.4     | 5.8     | 2.9  |
|                    | 1998 | 0.5     | 3.4     | 1.5  |
|                    | 1999 | 0.9     | 5.5     | 3.3  |
|                    | 2000 | 0.7     | 11.3    | 4.9  |
| JAMES YOUNG BK     |      |         |         |      |
|                    | 1997 | 0.2     | 0.5     | 0.3  |
|                    | 1998 | 0.2     | 1.1     | 0.7  |
|                    | 1999 | 0.6     | 0.6     | 0.6  |
|                    | 2000 | 0.3     | 0.5     | 0.4  |
| MEADOW BK          |      |         |         |      |
|                    | 1997 | 0.1     | 0.4     | 0.2  |
|                    | 1998 | 0.1     | 0.9     | 0.4  |
|                    | 1999 | 0.3     | 0.4     | 0.3  |
|                    | 2000 | 0.1     | 0.4     | 0.2  |
| METALIMNION        |      |         |         |      |
|                    | 1997 | 0.3     | 0.4     | 0.3  |
|                    | 1998 | 0.4     | 1.2     | 0.7  |

#### Table 11.

## PINE RIVER POND WAKEFIELD

### Summary of current year and historic turbidity sampling. Results in NTU's.

| Station      | Year | Minimum | Maximum | Mean |
|--------------|------|---------|---------|------|
|              | 1999 | 0.4     | 0.5     | 0.4  |
|              | 2000 | 0.2     | 0.4     | 0.3  |
| YOUNG'S COVE |      |         |         |      |
|              | 1998 | 0.9     | 0.9     | 0.9  |
|              | 1999 | 0.4     | 0.5     | 0.4  |